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the disease that seriously affects grouse. The figures of the structure of some of these forms are extremely good, and particularly useful are those of the larvæ of the Scatophaga.

M. E. RABAUD has published a brief but interesting article on the habits of certain solitary wasps known as Pompilidæ.⁹ He objects to the anthropomorphic interpretations frequently given of the habits of these insects. He notes much variation in the methods of capture and mutilation of prey, as well as in the interest they take in their work. He concludes that the sense which guides the insect in the selection of prey is sight and not smell.

THREE parts of the new "Coleopterorum Catalogus" of Dr. Schenkling have been issued: I., on the family Rhyssodidæ, 11 pp., is by R. Gestro; II., Nilionidæ, Othniidæ, Ægialitidæ, Petriidæ, Lagriidæ, 32 pp., is by F. Borchmann; III., Alleculidæ, 80 pp., is also by F. Borchmann. This name is used in place of the Cistelidæ; the interpretation of *Cistela* familiar to us being erroneous and now called *Gonodera* Muls. The catalogue is on the same plan as the famous catalogue of Gemminger and von Harold, but the derivations of the generic names are omitted.

To the ranks of the peculiar wingless Phoridæ Dr. Trägårdh adds a new genus⁷ from South Africa. *Cryptopteromyia jeanssoni* has the wings reduced to mere scales, barely visible, the antennæ have a large bulbous base and a long hairy tip, the legs are long and strong and the body is but weakly chitinized.

THE manual of Indian insects recently published by H. Maxwell-Lefroy and F. M. Howlett⁸ will undoubtedly be a most useful work for local students. It is a very bulky volume,

⁶ "Notes critiques sur les mœurs des Pompiles," *Bull. Sci. France, Belgique*, (7), XLIII, pp. 170-182, 1909.

⁷ "Cryptopteromyia, eine neue Phoriden-Gattung mit reduzierten Flügeln aus Natal, nebst Bemerkungen über Thaumatoxena und Termito-deipnus," *Zool. Jahrb., Abt. Syst.*, Vol. 28, pp. 329-346, 1909, 1 pl., 16 figs.

⁸ "Indian Insect Life: A Manual of the Insects of the Plains," Agric. Research Institute, Pusa, India, 1909, 786 pp., 535 figs., 83 pls., some colored.

and full of interest to those who are unfamiliar with the insects of India. The authors do not treat all Indian insects, those of the hills and the coasts being omitted. There is a long introduction telling of the structure and habits, collections in India, geographical divisions of India, relation of insects to man, etc. Each order is treated from the lowest up to the Rhynchota. Under each are directions for collecting the forms of each family, as well as habits, structure, life-history and number of species in India. As "interludes" are about eighteen chapters on general subjects scattered through the volume; such are: Cosmopolitan insects, deceptive coloring, galls, migration, song of insects, blood-sucking insects, aquatic insects, insects and flowers, etc. A number of figures are copied from other works, but most are original, and the plates are good, although, one fears, sometimes too highly colored. The economic importance of the various species is always considered, and most of the principal injurious forms are figured, often in all their stages.

NATHAN BANKS

THE BOTANICAL SOCIETY OF AMERICA

THE annual meeting of the Botanical Society of America was held in the Harvard Medical School, Boston, Mass., December 27-31, 1909, under the presidency of Professor Roland Thaxter, over fifty members being in attendance.

The officers for 1910 are:

President—Erwin F. Smith, Bureau of Plant Industry.

Vice-president—Louis R. Jones, University of Wisconsin.

Treasurer—Arthur Hollick, New York Botanical Garden.

Secretary—George T. Moore, Missouri Botanical Garden.

Councilors—William Trelease, Missouri Botanical Garden; F. E. Clements, University of Minnesota; C. L. Sheer, Bureau of Plant Industry.

The following eight botanists were elected associate members of the society: John Hendley Barnhart, New York Botanical Garden; Edward W. Berry, Johns Hopkins University; Mintin Asbury Chrysler, University of Maine; Reginald R. Gates, Missouri Botanical Garden; Otto Emery Jennings, Carnegie Museum; Aven Nelson, University of

Wyoming; Winthrop J. V. Osterhout, Harvard University; Robert Boyd Thompson, University of Toronto; and the following members were elected to full membership: C. E. Allen, University of Wisconsin; A. F. Blakeslee, Storrs Agricultural College; E. J. Durand, Cornell University; J. M. Greenman, Field Museum of Natural History, and Shigeo Yamanouchi, University of Chicago.

Special papers given by invitation of the council were:

"The Nature of Physiological Response," by C. R. Barnes.

"The Place of Plant Responses in the Categories of Sensitive Reactions," by F. C. Newcombe.

"The Distribution of the Vascular Plants of the Gaspé Peninsula, Quebec," by M. L. Fernald.

"A Consideration of the Species Plantarum of Linnaeus as a Basis for the Starting Point of the Nomenclature of Cryptogams," by W. G. Farlow.

The subject for the customary symposium was "Nuclear Phenomena of Sexual Reproduction in Thallophtes and Spermatophytes," and was participated in by B. M. Davis, who discussed the subject from the standpoint of the algæ; R. A. Harper, who considered the fungi; C. J. Chamberlain, for gymnosperms, and D. M. Mottier, for angiosperms.

It is expected that all of these papers will be published in *The American Naturalist* and reprints distributed to the members of the society.

Following are abstracts of the papers presented at the two scientific sessions held simultaneously on the afternoon of December 29:

Botanical Collecting in the Yukon Valley: A. S. HITCHCOCK, U. S. Department of Agriculture. By title.

Some Evaporation Experiments in Relation to Excessive Transpiration: K. M. WIEGAND, Wellesley College.

In order to determine, if possible, the comparative value to the plant of hairy and cutinized coverings, a series of evaporation experiments was made in which cotton or wax spread over an evaporating surface of saturated blotting paper were substituted for a hairy leaf or a cutinized leaf, respectively. Comparative readings of the loss of water from the variously treated blotting papers in still air and in wind were made, with the following results: the evaporation was retarded much more by the wax than by the hair; the efficiency of the hair, however, was much greater in wind than in the quiet, and even very thin hairy

coverings produced a noticeable retarding effect in wind. In sunshine the retarding effect was also marked. Plants might therefore be supposed to make use of waxy coverings when transpiration is to be retarded at all times, and hairy coverings when it is to be retarded only if exposed to strong dry winds and sunshine.

The Responses of the Guayule, Parthenium argentatum Gray to Irrigation: FRANCIS E. LLOYD, Alabama Polytechnic Institute.

A brief summary of the more important results of a study of the guayule, *Parthenium argentatum* Gray, under irrigation at Cedros, Mexico, for a period of two years, touching (1) the rate of growth, (2) the anatomical changes which ensue and (3) the rate and amount of rubber secretion together with a discussion of centers of secretion.

Guayule under irrigation makes an annual growth up to 25-30 cm. stem length, which appears to be approximately the maximum rhythmic response. Field plants in the same region make an average growth of 3 cm. Guayule responds readily, therefore, to irrigation, making plants of two to three pounds in weight from closely pollarded stocks.

At the close of two seasons' growth in August, 1908, irrigated plants showed only minute quantities of rubber. The same plants in the following April showed a large though not a maximum amount. Still more was found to occur in plants which had received less water of irrigation, this in growths of 1908 and 1909, in October, 1909. The conclusion is arrived at that, though the rate of secretion is slower in more rapidly grown plants, it may, after drought, approach fairly closely, if not entirely, to the maximum. The behavior under irrigation may be regarded as the behavior in feral plants with an exaggerated time element. In view of the total amount of growth, however, the conclusion that a total amount of secretion in an irrigated plant is greater in the long run than in a field plant is justified.

It is further shown that marked anatomical changes result from irrigation, chiefly affecting the volume of the cortex which is reduced under irrigation. The volume of the medullary rays is also much less, and sclerosis overtakes the medullary rays cells and sometimes the pith cells. The effect upon the amount of rubber is apparent in view of its distribution in these tissues, and not in the xylem and phloem (the parenchyma of these excepted).

The rubber is secreted from the secreting cells

of the resin canals as centers. The resin is not secreted within these cells and this supports Tschirch's view of resin secretion.

The paper was illustrated by means of photomicrographs and diagrams.

The Origin of Natural Parks: FREDERIC E. CLEMENTS, University of Minnesota.

During the past summer a special study was made of the natural openings typical of many of the mountain forests of Colorado. These so-called parks range in size from hundreds of square miles, as in South Park and San Luis Park, to a few acres. They occur in practically every one of the forest formations, and are themselves swamp, grassland or chaparral of varying structure. This was clearly found to be due to the fact that parks are only stages in successions, the ultimate stage of which is the surrounding forest in the great majority of cases. Fire was found to be the most frequent cause of the successions that produce parks, while some the largest and most striking are due to the filling of lakes with silt and plant remains. Parks also follow the filling up of canyons by sedimentation, while temperature and migration are more or less frequent causes of parks.

The Intensity of Alpine Light: FREDERIC E. CLEMENTS and FREDERIC K. BUTTERS, University of Minnesota.

Readings were made during the past summer in the Selkirk Mountains, on Mt. Rainier, and in the Rocky Mountains of Colorado in accordance with the same general plan. These were designed to test the series of results obtained in Colorado for a number of years, and to determine whether mountain regions with higher humidity would reveal greater absorption. The readings made in the two regions are in close, if not complete, agreement, and confirm the original conclusions that alpine light is little if at all stronger than the light at lower altitudes, and that it can not be an efficient cause of alpine dwarfing.

The Morphology of a Remarkable New Gymnospermous Genus: E. C. JEFFREY, Harvard University.

The genus is characterized by the possession of the wood structure found in the araucarian genera *Araucaria* and *Agathis*. It differs, however, strikingly from these genera in the possession of short shoots, which resemble rather those of *Ginkgo* than those of *Pinus*. The short shoot, or brachyblasts, persisted through many years and their bases, embedded in the secondary wood of

the main axis, in spite of their obvious perennial character, present only a single zone of annual growth. The short shoots were axillary to deciduous leaves, the traces of which, unlike those of *Agathis*, *Araucaria* and allied extinct genera, do not persist in the secondary wood. The genus is named *Woodworthia*. It constitutes one more link between the abietineous and araucarian conifers, which it is now apparent are connected by annectant transitional forms.

*Color Inheritance in *Lychnis dioica*:* GEORGE HARRISON SHULL, Station for Experimental Evolution, Carnegie Institution.

Several years ago I showed that the purple color of *Lychnis dioica* is a typical Mendelian dominant character. It has since been found to present several distinct grades of color, not noted at first, but now shown to be due to distinct Mendelian unit-characters. Most noteworthy of these is a light bluish-purple tint due to basic anthocyan, which is *hypostatic* to the corresponding acid or reddish-purple anthocyan. Blue anthocyan has generally been found to be *epistatic* to red in other cases.

*Notes on the Behavior of Certain Hybrids of *Oenothera* in the First Generation:* BRADLEY MOORE DAVIS, Cambridge, Mass.

A demonstration and discussion of material illustrating the characteristics in the first generation of the following hybrids of *Oenothera*: (1) *gigas* \times *Lamarckiana*, (2) *muricata* \times *gigas*, (3) *muricata* \times *grandiflora*, (4) *grandiflora* \times *biennis*, (5) *biennis* \times *grandiflora*.

The characters of the parents, as presented in each cross, were so blended that as regards the measurements of parts, habit, texture of foliage, etc., the average for each set of hybrids would probably present a fair mean between the parents concerned. There was, however, a wide range of variation in the resemblance of the hybrids to one or the other of the parents.

No character of either parent was discovered which appeared as dominant in these hybrids of the F_1 generation, after the manner which has been described for certain forms (e. g., *Pisum*) that illustrate most conspicuously Mendelian dominance in the first generation.

Some of the hybrids of each cross presented a greater resemblance to one parent and some to the other, and the forms could therefore be arranged in two groups (twin hybrids) in one of which the maternal characters were most evident and in the other the paternal. There was no clear evidence

that the hybrids of these cultures carried in marked preponderance the paternal characters (patroclinous), or, on the other hand, that maternal characters were more prominent. The range of variation among the hybrids was too great to permit of such conclusions.

The Effect of Some Toxic Solutions on Mitosis in Vicia faba: W. W. STOCKBERGER, Bureau of Plant Industry, U. S. Department of Agriculture.

Root-tips of *Vicia faba* were exposed for varying lengths of time to the action of very dilute and to more concentrated solutions of copper sulphate, phenol and strychnine. As a result the achromatic figure was frequently enlarged and the spindle seemed to increase in size. Later the spindle fibers were more seriously affected, becoming disorganized, while numerous vacuoles formed in the cytoplasm. Mitosis was interrupted, but without deformation of the chromatic figure. Formation of the cell plate was often prevented, following which, however, complete reconstitution of the nuclei was not observed. Neither the binucleate cells nor the nuclear fusions of some authors occurred in the material studied. No amitosis was observed and there was no evidence that it is produced by these solutions. The interpretation as departures from the normal due to the toxic solution of the numerous aberrant forms which occurred in the toxicated material was negated by the occurrence of similar forms in the controls. Material grown in distilled water was affected in much the same manner as that in the toxic solutions. When toxic salts were used in great dilutions it became very difficult to distinguish between their effect and the physical action of the solution in which they were dissolved.

Nuclear Organization in the Conidia of Spherotheca: R. H. HARPER, University of Wisconsin. Polarized nuclei with a central body in permanent connection with the nuclear chromatin and similar in all respects to those described for the ascocarp and mycelium of *Phyllactinia* are found also in all stages of the development of the conidia of the *Spherotheca* on *Bidens*.

The resting stages are of especial importance, as it is at this time that the connection of centrosomes and chromatin is of especial significance as giving evidence of the permanence of the chromosomes as definitely organized bodies.

The center in these conidial nuclei is disk-shaped and lies on the outside of the nuclear membrane. Cases in which the center is pulled

into the cavity of the nucleus are found, but are plainly artefacts due to fixation, as are probably also the similar cases figured by Maire and Guilliermond. The chromatin in the resting condition may appear almost homogeneous and evenly distributed in the nuclear cavities, but even here a few strands show the special connection of the mass with the central body.

In the prophase the granular material becomes gradually aggregated in strands which show a definite orientation toward the central body. The gradual differentiation of a spirem can be traced in all its stages and the heavy strands finally formed are always attached at one end to the center. Throughout the resting stage and prophase organic connection is maintained between the central body and chromatin and thus a mechanism is provided for the maintenance of the individuality of the chromosomes through the processes of splitting in nuclear division and of fusion in pairs side by side in fertilization. The spindle formation follows the usual type which I have described for the nuclei of the ascus.

Nuclear Phenomena in Lachnea scutellata: WILLIAM H. BROWN, Johns Hopkins University. By invitation.

The asci of *Lachnea scutellata* arise from a one-celled ascogonium at the base of the fruit-body. No antheridium has been observed and no fusion or pairing of nuclei in the ascogonium or young ascogenous hyphæ. The nuclei of the vegetative hyphæ, ascogonium and ascogenous hyphæ show five chromosomes. During prophase these chromosomes may be close together and resemble a second nucleolus. In reorganizing, the daughter-nuclei are often so close together as to appear to be fusing. These two phenomena may have been mistaken by some for fusing nuclei.

The usual hooks are formed at the ends of the ascogenous hyphæ. The two nuclei of the penultimate cell may fuse and give rise to the nucleus of an ascus, or they may not, in which case a second hook is formed. An opening is formed between the ultimate and penultimate cells and the nucleus of the penultimate migrates into the ultimate, which may then form a second ascus or another hook. This process may be repeated many times.

The first division of the nucleus of the ascus is the reducing division and shows the usual heterotypic prophase. It is the only division that shows the diploid number of chromosomes.

The spore wall is laid down near the outer

limits of the recurved spindle fibers, but it is not formed out of them.

Two Trunk Diseases of the Willow Oak (Quercus phellos): HERMANN VON SCHRENK, St. Louis, Mo.

The willow oak is attacked by two polyporoid fungi which destroy the heart wood. No such diseases have hitherto been described, and the discovery at this time was due to the unusual hurricane which destroyed vast numbers of trees in the southern states during the past fall.

A description of the cause of the disease, the manner in which the trees are attacked and destroyed and the distribution form the chief topics of the paper.

A Trunk Disease of the Osage Orange (Toxylon pomiferum): HERMANN VON SCHRENK, St. Louis, Mo.

The osage orange has hitherto been considered as practically immune from fungus diseases. The wood of this tree is very indestructible when used for structural purposes, and so far as known, no fungus ever attacks the heart wood. The present paper describes the finding of fungus disease of the heart wood, which occurs in living trees. This disease is of particular interest in view of the geologic age of the genus, and furthermore in view of the fact that this is the first case of a trunk disease of this species.

Studies on the Toxicology of Diplodia zeæ: HOWARD S. REED, Agricultural Experiment Station, Blackburg, Virginia.

A brief examination of the literature dealing with the etiology of pellagra shows great diversity of opinion as to the identity of the fungi held responsible for the deleterious property of the affected maize. In this connection attention is called to the recent spread in this country of *Diplodia zeæ*. This fungus became conspicuous as the cause of wide-spread injury to maize almost simultaneously with the appearance of pellagra. It is also present in European countries where pellagra is found. Recent studies have shown that the fungus lives parasitically upon the growing maize as well as saprophytically upon the mature grain.

The author has in progress chemical and physiological experiments upon the properties of maize infected with *Diplodia*. The chemical substances isolated to date have similarity to those isolated by Lombroso. Physiological experiments have shown that the infected maize is toxic to small animals.

Some Notes on Sclerotinia fructigena: JAMES B. POLLOCK, University of Michigan.

Aderhold suggested in 1905 that the species of *Sclerotinia* commonly attacking stone fruits in the United States was *S. cinerea* and not *S. fructigena*, as had been assumed. He based his opinion on several facts: the color of the tufts of macroconidia on the attacked fruits, the size of the conidia, the occurrence in Europe of *S. cinerea* chiefly on stone fruits and of *S. fructigena* on pome fruits, and lastly on the size of asci and ascospores which Norton described in 1902.

Studies were made on material collected at Ann Arbor and Lansing, Michigan, and this was compared with the reports of various workers in Europe and the United States. The conclusions reached are:

Norton's measurements for asci and ascospores are probably incorrect. The apothecia found in Michigan as well as in other parts of the United States agree very closely with those of *Sclerotinia fructigena* as found in Europe. There is a wide range in the size of the macroconidia, especially on artificial media, and as found in nature they are generally smaller in the United States than in Europe.

In the United States the species occurs more commonly on stone fruits, and in Europe more commonly on pome fruits.

Sclerotinia fructicola (Winter) Rehm is in all probability the same species as *Sclerotinia fructigena* (Pers.) Norton.

The Present Status of the Cytology of the Rusts:

E. W. OLIVE, South Dakota State College of Agriculture and Mechanic Arts.

Only fourteen species of rusts have contributed so far toward a solution of the problem as to the sexual cell fusions in this group of fungi. Of this number, nine were æcial forms, five telial. Blackman himself leaves his four telial species in a doubtful condition; and the writer's work on the development of the æcidium cup forms casts doubt on the interpretation of both Christman and Blackman as to the four cup forms which they studied; thus leaving only six species in a presumably stable condition as to the method of sexual union. Of these six species, three—*Gymnoconia interstitialis*, *Phragmidium speciosum* and *Phragmidium violaceum*, belong to the diffuse cæoma type of æcidium; two—*Phragmidium potentillæ-canadensis* and *Triphragmium ulmaricæ*, to the primary uredo type, and one—*Puccinia transformans*, to the micro-puccinia type.

To this list the writer is now able to add three of the cup-æcidium type of rusts as showing sexual fusions. Further, a large proportion of the fifty species of æcidium cups under investigation have been found to show a multinucleated stage in their development; this stage following, in the three species above mentioned, the sexual fusions. A contribution has been also made in this investigation toward the solution of the problem as to the origin and function of the peridium, it being found to arise in the manner described by Rosen and Richards. Some observations seem to show, moreover, that the peridial cells exert a sort of digestive function, in addition to acting as a protection to the expanding æcidial mass.

Cultures of Uredineæ in 1909: J. C. ARTHUR, Purdue University.

The paper covers a report in detail of the work in growing plant rusts during the year 1909, this being the eleventh year that the work has been carried on. It is almost entirely devoted to the heterœcious species of grass, sedge and cedar forms. One new species of the last has been separated, having æcia on *Amelanchier* leaves of the type of *Ræstelia cornuta* and telia on the branches of red cedar. Only one new combination was worked out among the grass rusts, and none among the sedge rusts, but much additional information is reported on species previously cultivated.

GEORGE T. MOORE,
Secretary

SOCIETIES AND ACADEMIES

THE PHILOSOPHICAL SOCIETY OF WASHINGTON

THE 676th meeting was held on February 12, 1910, President Woodward in the chair. Two papers were read.

The Solar Constant of Radiation: C. G. ABBOT, of the Astrophysical Observatory of the Smithsonian Institution.

The speaker stated that when in 1903 determinations of the solar constant of radiation were begun by the Smithsonian Astrophysical Observatory, values ranging from Pouillet's 1.76 to Angström's (withdrawn) value of 4.1 calories were quoted in the best text-books, generally with a preference for Langley's value 3.0 calories. The discrepancy existed (1) because no international standard scale of pyrheliometry had been established, so that measurements of different observers might differ by ten or even twenty per cent., according to what pyrheliometer they employed;

(2) because, since no spectrum energy measurements had been made except by Langley (and his wrongly reduced), the observations made were incapable of yielding the correction for loss in air, and hence recourse was had to purely empirical and untrustworthy formulæ of extrapolation.

At Washington, Mt. Wilson and Mt. Whitney (sea-level, one mile and three miles elevation) complete spectro-bolometric and pyrheliometric measurements have been made on several hundred different days from 1903 to 1909. Simultaneous determinations at Washington and Mt. Wilson in 1905 and 1906 agreed within the probable error of the Washington observations. Simultaneous observations at Mt. Wilson and Mt. Whitney in 1909 agreed within 0.5 per cent. Hence it is believed that the formula of Bouger for the atmospheric extinction of monochromatic rays (such as the bolometer observes) is not only theoretically well grounded, but experimentally verified, for otherwise the solar constant values obtained by its aid from such different atmospheric levels could hardly agree.

Three different copies of Abbot's water-flow standard pyrheliometer have been tried on Mt. Wilson with closely agreeing results. In this instrument the measurements are checked by observing known quantities of heat electrically introduced. The scale of the instrument appears to be about three per cent. above that of the new Angström pyrheliometers, but careful redeterminations of the constants of the Abbot pyrheliometers are now being made by Mr. Aldrich, and these may alter the scale by as much as one per cent. When verified, four silver disk secondary pyrheliometers of the Smithsonian Institution will be calibrated to this scale and sent abroad to promote a uniform international system of pyrheliometry.

Provisionally the mean value of the solar constant may be given as 1.92 calories per square centimeter per minute.

Mr. Abbot also spoke briefly of the apparent variations of the solar constant of radiation.

The Nitrogen Thermometer from Zinc to Palladium: A. L. DAY and R. B. SOSMAN, of the Geophysical Laboratory of the Carnegie Institution of Washington. Presented by R. B. Sosman.

The preliminary work of Day and Clement at the geophysical laboratory developed the apparatus for accurate measurement of temperatures with the nitrogen thermometer. It consisted of